obvious over Angelsen (USP 4,757,818). Claims 6, 18, and 26 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Angelsen (USP 4,757,818) as applied to claims 1, 13, and 21, and further in view of Yagami et al. (USP 5,546,947). Claims 9-12, 14, and 29-32 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Angelsen (USP 4,757,818) as applied to claims 1, 13, and 21, and further in view of Martin et al. (USP 5,398,691). Applicants respectfully traverse the outstanding rejections for reasons set forth hereafter.

Claims 1-3, 5, 7, 8, 13, 15-17, 19-23, 25, 27, and 28 have been rejected under 35 U.S.C. § 102(b) as being unpatentable by Angelsen. Claims 1 and 13 recite "a transducer array pivotally mounted within the housing" (emphasis added), and claim 21 recites the step of "mounting a transducer array for pivotal motion around a rotation axis" (emphasis added), features which are neither disclosed nor suggested in Angelsen. The Office Action states that Angelsen discloses an ultrasound probe with a transducer array. However, the transducer 230 of Angelsen is not a transducer array, but rather a single acoustic transducer 230 which transmits a single ultrasound beam. Angelsen does not disclose or suggest the use of a transducer array. The transducer array of claims 1, 13, and 21 transmits multiple ultrasound beams, and thus may be held at a desired scan plane while obtaining images. In contrast, the transducer 230 of Angelsen must be scanned to produce a sector image, and if held at a particular position, only a single line of image data is acquired. Therefore, claims 1, 13, and 21 are patentable over Angelsen.

Claims 2, 3, 5, 7, 8, 15-17, 19, 20, 22, 23, 25, 27, and 28 ultimately depend from one of claims 1, 13, or 21, and are patentable over Anglesen for the reasons given above. Moreover, these claims recite features that further distinguish over Angelsen. For example, claim 2 further recites that "the control member comprises a stepper motor disposed in the housing." Claim 15 recites that "the motor is a stepper motor disposed in the housing." Claim 22 recites the step of "providing a stepper motor disposed in the housing." The Office Action states that "Angelsen discloses incremental motor to scan the region of interest with predetermined interval for each increment." In actuality, Angelsen neither discloses nor suggests using a stepper motor in the cited text or anywhere else. Rather, Angelsen states design criteria for the probe which teach away from an incremental motor, such as a stepper motor, stating that "it is desired to provide for constant sweep

velocity of the ultrasonic beam (i.e. no high frequency vibrations) to thereby avoid high Doppler shifts in the signals from tissue and thus artifacts in the flow image." (col. 3, lines 15-19) Therefore, claims 2, 15, and 22 are patentable over Angelsen.

Claims 5, 17 and 25 further require "a position sensing device for sensing an angular position of the transducer array with respect to a reference angle." Angelsen, however, employs "a position sensor for detecting linear motion of the coil rather than angular motion of the transducer." (col. 4, lines 63-65) Angelsen states that "[t]he inductance of second coil 220 will accordingly depend on its position relative to magnetic shaft portion 216, and thus on the position of coil assembly 208; coil 220 can therefore be readily employed as a simple position sensor." (col. 4, lines 25-29) Therefore, Angelsen teaches away from the use of a position sensing device for sensing an angular position of the transducer array, and instead teaches detecting a position of the motor coil or using bicoil induction, as stated in col. 5, lines 2-3. Therefore, claims 5, 17, and 25 are patentable over Angelsen.

Claims 4 and 24 have been rejected under 35 U.S.C. § 102(b) as being anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as obvious over Angelsen. Claims 4 and 24 depend from claims 1 and 21, respectively, and are patentable over Angelsen for the reasons given above. Moreover, Angelsen fails to disclose or suggest that "the control member comprises a handcrank" (as recited in claims 4) or the step of "providing a handcrank" (as recited in claim 24). In fact, using a handcrank to control the rotation of the transducer would render the system of Angelsen unsatisfactory for its intended purpose by not meeting the stated design criteria of providing rapid acceleration of the beam direction to minimize switching time between modes of operation, providing constant sweep velocity of the ultrasonic beam, and avoiding arrangements which can cause or introduce vibrations. (col. 3, lines 8-25) Therefore, claims 4 and 24 are neither anticipated nor rendered obvious by Angelsen.

Claims 6, 18, and 26 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Angelsen as applied to claims 1, 13, and 21, and further in view of Yagami. Claims 1, 13, and 21 (and hence their dependent claims 6, 18, and 26) are patentable over Angelsen for the reasons given above. Yagami fails to address the deficiencies of Angelsen. Namely, Yagami fails to

disclose or suggest "a transducer array pivotally mounted within the housing" (as recited in claims 1 and 13), and the step of "mounting a transducer array for pivotal motion around a rotation axis" (as recited in claim 21). Therefore, claims 6, 18 and 26 are patentable over Angelsen in view of Yagami.

Moreover, claims 6, 18, and 26 recite further patentable features which distinguish these claims from Angelsen and Yagami. Claims 6 and 18 both recite "an optical sensing device for sensing an angular position of the transducer array with respect to a reference angle." Claim 26 recites the step of "providing an optical sensing device for sensing an angular position of the transducer array with respect to a reference angle." As referenced in the Office Action, Yagami states "an optical sensor (end of fiber optics, for example) can be used in place of or in addition to the ultrasonic transducer 111." (col. 11, lines 55-57) First, if Angelsen's transducer were replaced with an optical sensor, as suggested by Yagami, Angelsen's invention would be rendered inoperable for its intended purpose. In addition, there is no suggestion in the cited text or anywhere else in Yagami to sense an angular position of the transducer or a transducer array with respect to a reference angle with an optical sensor or any other device. Thus, claims 6, 18, and 26 are patentable over Angelsen and Yagami, taken alone or in combination.

Claims 9-12, 14, and 29-32 have been rejected under 35 U.S.C. § 103(a) as being unpatentable over Angelsen as applied to claims 1, 13, and 21, and further in view of Martin. Claims 1, 13, and 21 (and hence independent claims 9-12, 14, and 29-32) are patentable over Angelsen for reasons given above.

Claims 9 and 29 further require that "the probe is configured to obtain 3D volumes of scan planes." (emphasis added) It is respectfully submitted that Martin does not utilize a probe to obtain 3D volumes of scan planes, but instead relies on an additional magnetic field generator 20 to generate "three mutually orthogonal dipole fields, which define the coordinate axes of a fixed three-dimensional reference frame (i.e., the x, y and z axes of a Cartesian coordinate system)." (col. 5, lines 6-9) Martin states that "For example, as is shown in FIG. 1, magnetic field generator 20 can be located directly below the patient's torso in a recess 23 in an operating table 25 or other surface that supports patient 12." (col. 4, line 67 – col. 5, line 3) Furthermore, Angelsen does not teach or

suggest obtaining 3D volumes of scan planes. Therefore, claims 9 and 29 are patentable over Angelsen in view of Martin.

Claim 10 further recites "a button directing the control member to rotate the transducer array a predetermined number of degrees each time the button is pressed," and claim 30 further requires the step of "providing a button for rotating the transducer array a predetermined number of degrees each time the button is pressed." Claim 11 further recites "a button directing the control member to rotate the transducer array to a predetermined position relative to the central scan plane," and claim 31 further recites the step of "providing a button for rotating the transducer array to a predetermined position relative to the central plane." Applicants disagree that the control knobs 16, 18 and/or 19 of Martin can be viewed as an incremental button to control the angle of rotation, as stated in the Office Action. Specifically, Martin states that "the previously mentioned control knob 19 for controlling flexure of ultrasonic probe 14 is mounted concentrically with control knob 16 (which, as previously mentioned, controls rotation of the scanning pattern produced by probe 14 about one of two orthogonal axis)." (col. 7, lines 61-66) Martin further states that:

> control knob 18, which controls rotation of the ultrasonic scanning plane produced by ultrasonic probe 14 about a second orthogonal axis extends outwardly from the rear portion of handle 32. Located within the interior of handle 32 is a 90 degree drive unit (not shown in FIG. 2), which couples control knob 18 to a small diameter flexible shaft 44. In the currently preferred embodiments the drive unit is a 1:5 speed reducer (col. 8, lines 14-22, emphasis added).

Therefore, Martin is silent as to a button for rotating a transducer array a predetermined number of degrees or to a predetermined position, and thus claims 10, 11, 30 and 31 are patentable over Angelsen and Martin.

It is respectfully submitted that the pending claims define allowable subject matter. Should anything remain in order to place the present application in condition for allowance, the Examiner is kindly invited to contact the undersigned at the telephone number listed below.

Please charge any additional fees or credit overpayment to the Deposit Account of McAndrews, Held & Malloy, Ltd., Account No. 13-0017.

Respectfully submitted,
McANDREWS, HELD & MALLOY, LTD.

Date: January 23, 2003

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